LDS QA/QC
Quality Control/Quality Assurance

Jill S. Heaton, UNR
Melissa Brenneman, Topoworks
Clarence Everly and staff, MDEP

What is QA/QC?

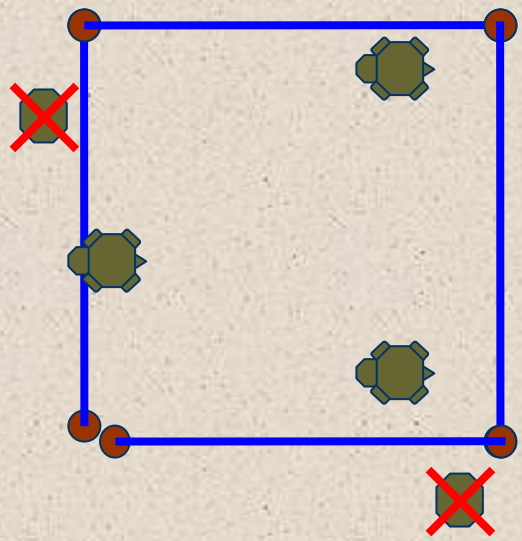
- A set of documented procedures that
  - outline responsibilities and responsible parties
  - documents the methods of data collection
  - ensure that the chosen methods actually support the research objectives
  - ensure the data are accurate
  - produce usable data
  - provide for archived, easily accessible data

Topics

- Evolution of the Data Collection process
- Evolution of the QA/QC process
- QA/QC Products
- QA/QC Status

Data Collection

- 2001
  - Paper data sheets



10 GPS Coordinates x 11 numbers
= 110 data entry key strokes

DESERT TORTOISE DISTANCE SAMPLING TRANSECT FORM

SITE SUPERIOR-CRONESE OBSERVERS E. STANDS / C. BLANDFORD TRANSECT NO. 11 204

DATE 12 APR 01 NO. LIVE 3 NO. DEAD 2

	TIME (PST)	TEMPERATURES (°C) 1.5 m	1 cm	GRND	WIND[1]	CLOUDS % AND TYPE
START	0943	14.5	17	15.5	1	5% CIRRUS
END	1400	24	26	28	1	3% CIRRUS

START LOCATION EASTING 0490893 NORTHING 3871771 ELEV (m) 747

DATA FORM STATUS ☐ entered ☐ proofed

PHO EF #12 #13

TORTOISE 1

UTM EASTING	UTM NORTHING	TIME (PST)	TEMP (°C,1 cm)	PERP DIST (to 0.1 m)	SEX	MCL (mm)	WEIGHT (g)	POSITION[2]	BEHAVIOR[3]
0490885	3871784	0955	16	9.5	M	196	1500	SHADE	RESTING

URTD ☐ YES ☒ NO ☐ UNK SIGNS

LESIONS ☒ YES ☐ NO ☐ UNK CAR 4 % PLAS 1 %

COMMENTS LESIONS DUE TO TRAUMA

TORTOISE 2

UTM EASTING	UTM NORTHING	TIME (PST)	TEMP (°C,1 cm)	PERP DIST (to 0.1 m)	SEX	MCL (mm)	WEIGHT (g)	POSITION[2]	BEHAVIOR[3]
0491088	3872195	1145	23	27.9	M	253	3650	OPEN	WALKING

URTD ☐ YES ☒ NO ☐ UNK SIGNS

LESIONS ☐ YES ☒ NO ☐ UNK CAR % PLAS %

COMMENTS

TORTOISE 3

UTM EASTING	UTM NORTHING	TIME (PST)	TEMP (°C,1 cm)	PERP DIST (to 0.1 m)	SEX	MCL (mm)	WEIGHT (g)	POSITION[2]	BEHAVIOR[3]
0491296	3871754	1315	28.5	7.4	F	240	2750	OPEN	WALKING

URTD ☐ YES ☒ NO ☐ UNK SIGNS

LESIONS ☐ YES ☒ NO ☐ UNK CAR % PLAS %

COMMENTS

CARCASS 1

UTM EASTING	UTM NORTHING	TIME (PST)	PERP DIST (to 0.1 m)	SEX	MCL (mm) OR SIZE CLASS	POSITION[4]	TIME SINCE DEATH
0490920	3871816	1020	26.8	UNK	128	VEGETATION	☐ < 1 yr ☒ 1-2 yrs ☐ 2-4 yrs ☐ >4 yrs

COMMENTS

CARCASS 2

UTM EASTING	UTM NORTHING	TIME (PST)	PERP DIST (to 0.1 m)	SEX	MCL (mm) OR SIZE CLASS	POSITION[4]	TIME SINCE DEATH
0490887	3871849	1028	3.8	F	265	OPEN	☒ < 1 yr ☐ 1-2 yrs ☐ 2-4 yrs ☐ >4 yrs

COMMENTS

CARCASS 3

UTM EASTING	UTM NORTHING	TIME (PST)	PERP DIST (to 0.1 m)	SEX	MCL (mm) OR SIZE CLASS	POSITION[4]	TIME SINCE DEATH
							☐ < 1 yr ☐ 1-2 yrs ☐ 2-4 yrs ☐ >4 yrs

UTM RTHING | TIME (PST) | PERP DIST (to 0.1 m) | SEX | MCL (mm) OR SIZE CLASS | POSITION[4] | TIME SINCE DEATH ☐ < 1 yr ☐ 1-2 yrs ☐ 2-4 yrs ☐ >4 yrs

CARCASS 5

UTM EASTING	UTM NORTHING	TIME (PST)	PERP DIST (to 0.1 m)	SEX	MCL (mm) OR SIZE CLASS	POSITION[4]	TIME SINCE DEATH
							☐ < 1 yr ☐ 1-2 yrs ☐ 2-4 yrs ☐ >4 yrs

COMMENTS

Data Collection

- In 2001 there were as few as 5 GPS points per transect. In 2005 there were as many as 25 per transect.
- In 2001 there were 10 columns of data. In 2005 there were 58 columns of data.
  - Threats-exotics, ravens, roads, canids, etc.
  - Disease-extensive health forms, blood collection
  - Genetics
  - Behavioral
  - etc.

Data Collection

- Composed of a large number of records

Characteristic	Yearly variation
Total records	12,000 to 24,000
Observers	50 to 100
Transects	700 to 2,200
Total km walked	3,000 to 9,500
Waypoints	9,000 to 22,000
Observations	1,500 to 2,100

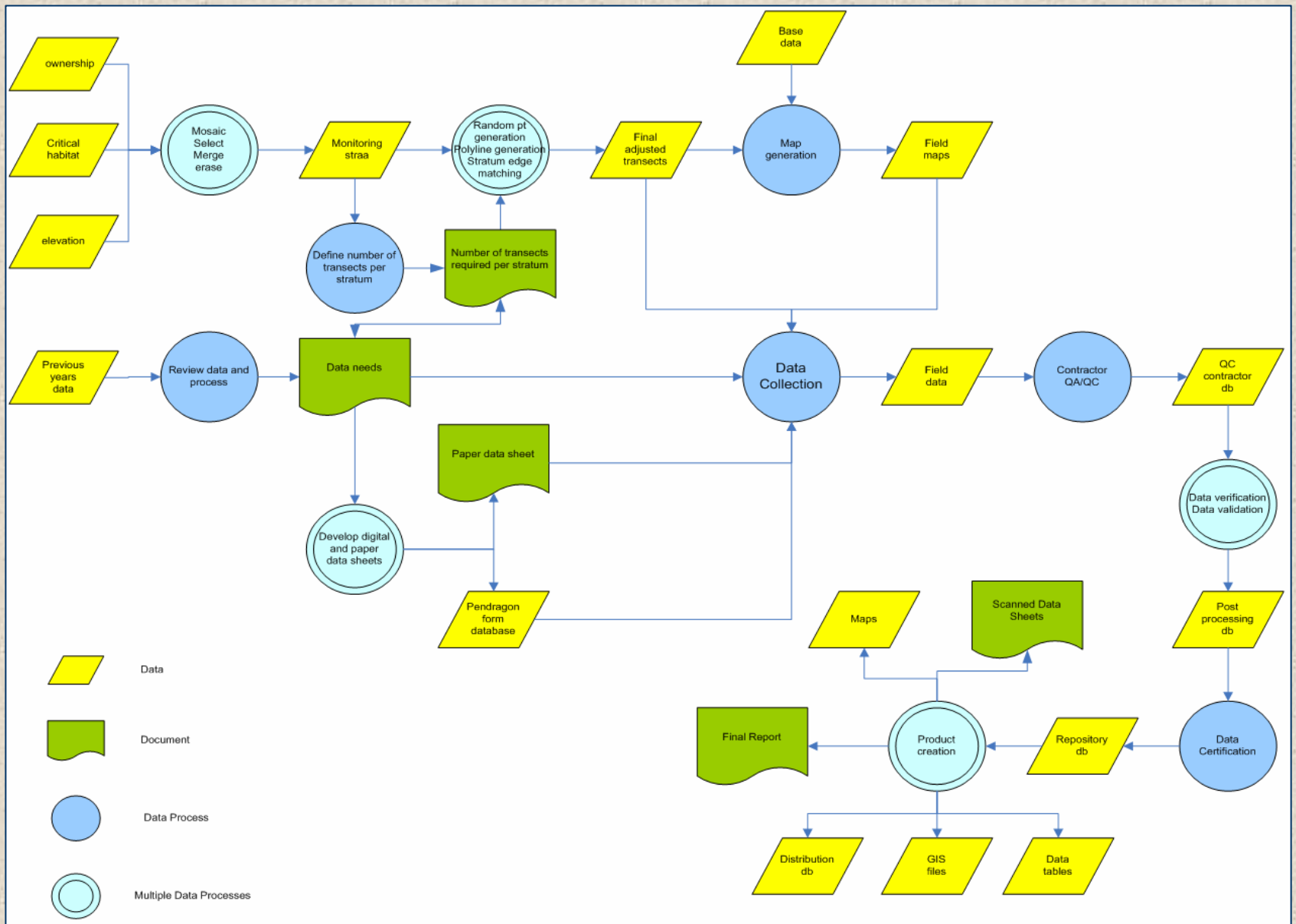
Data Collection

- **2002-2005**
  - **Paper data sheets**
  - **PDA**

Need for QA/QC

- The need for a formal Data Management Plan and QA/QC process were identified after the 2003 sample season.
- A Data Management Plan and QA/QC Process were implemented simultaneously/retroactively with the 2004 sampling year.

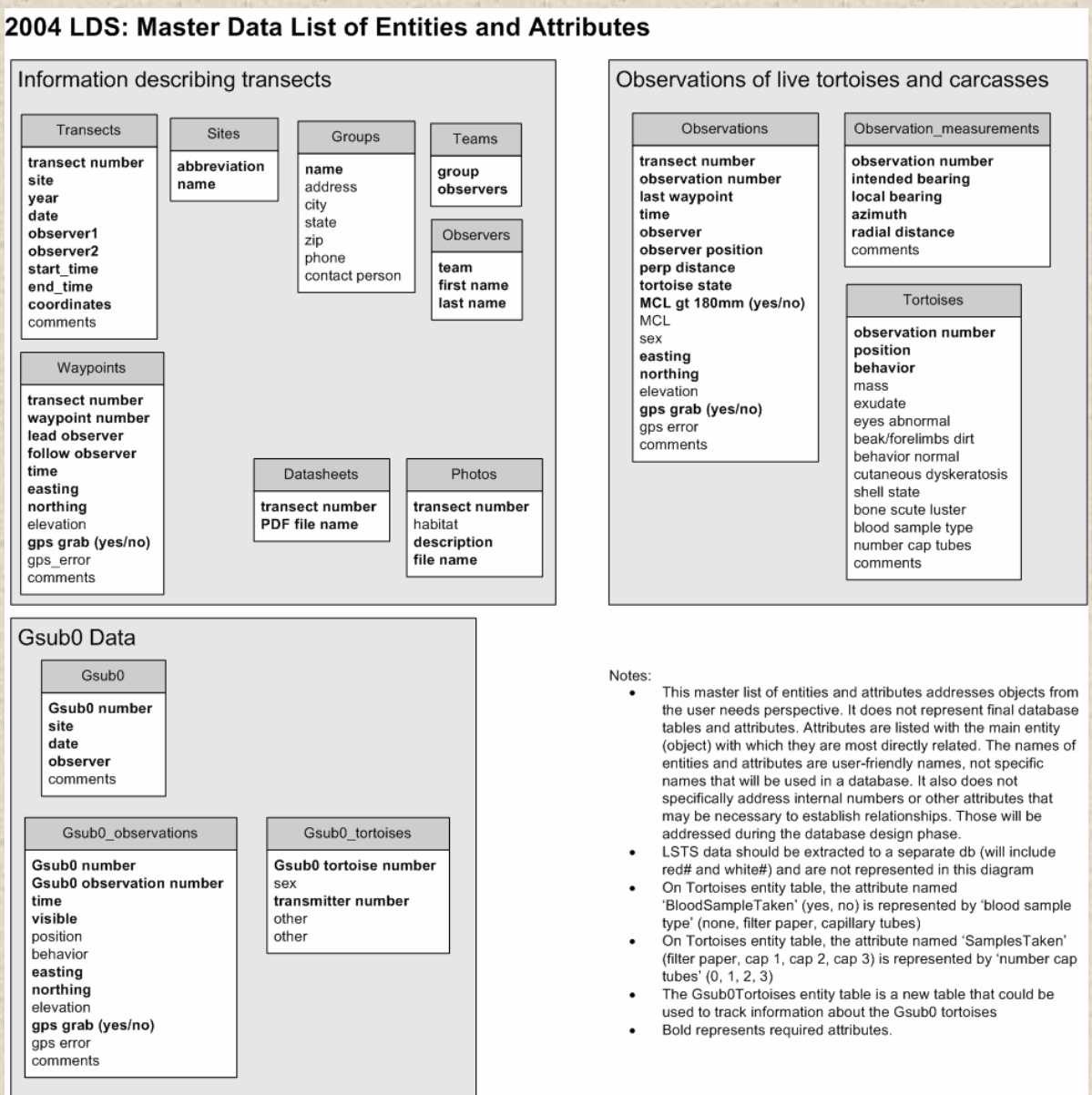
Workflow


ownership
Critical habitat
elevation
Mosaic Select Merge erase
Monitoring straa
Random pt generation Polyline generation Stratum edge matching
Base data
Final adjusted transects
Map generation
Field maps
Define number of transects per stratum
Number of transects required per stratum
Previous years data
Review data and process
Data needs
Data Collection
Field data
Contractor QA/QC
QC contractor db
Paper data sheet
Data verification Data validation
Develop digital and paper data sheets
Pendragon form database
Maps
Scanned Data Sheets
Post processing db
Final Report
Product creation
Repository db
Data Certification
Distribution db
GIS files
Data tables
Data
Document
Data Process
Multiple Data Processes

Spatial Data Needs Assessment

Feature classes	Feature types	Need/Question	Mechanism to address	QC process
waypoints, transects	point, line	waypoints should be coincident with transect lines.	Use geodatabase topology rule: points must be covered by line.	Validate topology.
waypoints, transects	point, line	Should not be more than 'x' waypoints on one transect. Check data to determine the value of x.	Specify cardinality in relationship class. Check to see if exceptions can exist.	Validate.
waypoints, transects, site	point, line, poly	Transects and waypoints should be within a buffer (50m) of the site (monitoring strata).	Store buffered sites and use geodatabase topology rule for waypoints: must be properly inside polygons Create a custom relationship class extension or a geoprocessing script to check that the points are within the correct site. If possible, check for 25 m, but allow up to 50.	If rel class extension: validate If script: validate + run script
waypoints	point	Add elevation from NED	Create geoprocessing script.	Run script.
observations	point	Add elevation from NED	Create geoprocessing script.	Run script.
observations	point	Observations should be within a butffer (50m or 100m) of the transect.	Create a custom relationship class extension or a geoprocessing script.	Validate or run script

Data Dictionary



2004 LDS: Master Data List of Entities and Attributes

Information describing transects

Transects
transect number
site
year
date
observer1
observer2
start_time
end_time
coordinates
comments

Sites
abbreviation
name

Groups
name
address
city
state
zip
phone
contact person

Teams
group
observers

Observers
team
first name
last name

Waypoints
transect number
waypoint number
lead observer
follow observer
time
easting
northing
elevation
gps grab (yes/no)
gps_error
comments

Datasheets
transect number
PDF file name

Photos
transect number
habitat
description
file name

Observations of live tortoises and carcasses

Observations
transect number
observation number
last waypoint
time
observer
observer position
perp distance
tortoise state
MCL gt 180mm (yes/no)
MCL
sex
easting
northing
elevation
gps grab (yes/no)
gps error
comments

Observation_measurements
observation number
intended bearing
local bearing
azimuth
radial distance
comments

Tortoises
observation number
position
behavior
mass
exudate
eyes abnormal
beak/forelimbs dirt
behavior normal
cutaneous dyskeratosis
shell state
bone scute luster
blood sample type
number cap tubes
comments

Gsub0 Data

Gsub0
Gsub0 number
site
date
observer
comments

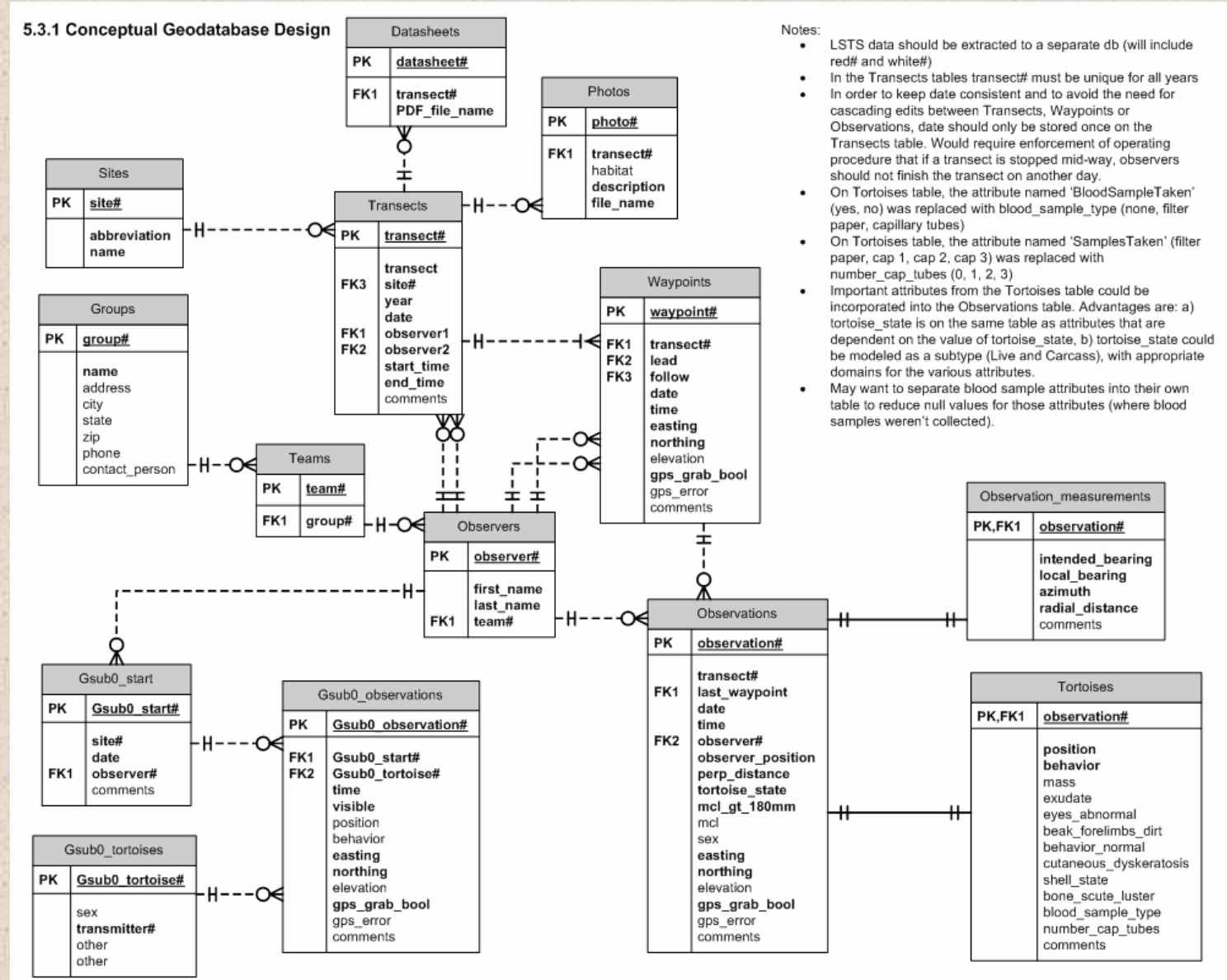
Gsub0_observations
Gsub0 number
Gsub0 observation number
time
visible
position
behavior
easting
northing
elevation
gps grab (yes/no)
gps error
comments

Gsub0_tortoises
Gsub0 tortoise number
sex
transmitter number
other
other

Notes:

- This master list of entities and attributes addresses objects from the user needs perspective. It does not represent final database tables and attributes. Attributes are listed with the main entity (object) with which they are most directly related. The names of entities and attributes are user-friendly names, not specific names that will be used in a database. It also does not specifically address internal numbers or other attributes that may be necessary to establish relationships. Those will be addressed during the database design phase.
- LSTS data should be extracted to a separate db (will include red# and white#) and are not represented in this diagram
- On Tortoises entity table, the attribute named 'BloodSampleTaken' (yes, no) is represented by 'blood sample type' (none, filter paper, capillary tubes)
- On Tortoises entity table, the attribute named 'SamplesTaken' (filter paper, cap 1, cap 2, cap 3) is represented by 'number cap tubes' (0, 1, 2, 3)
- The Gsub0Tortoises entity table is a new table that could be used to track information about the Gsub0 tortoises
- Bold represents required attributes.

Database Design

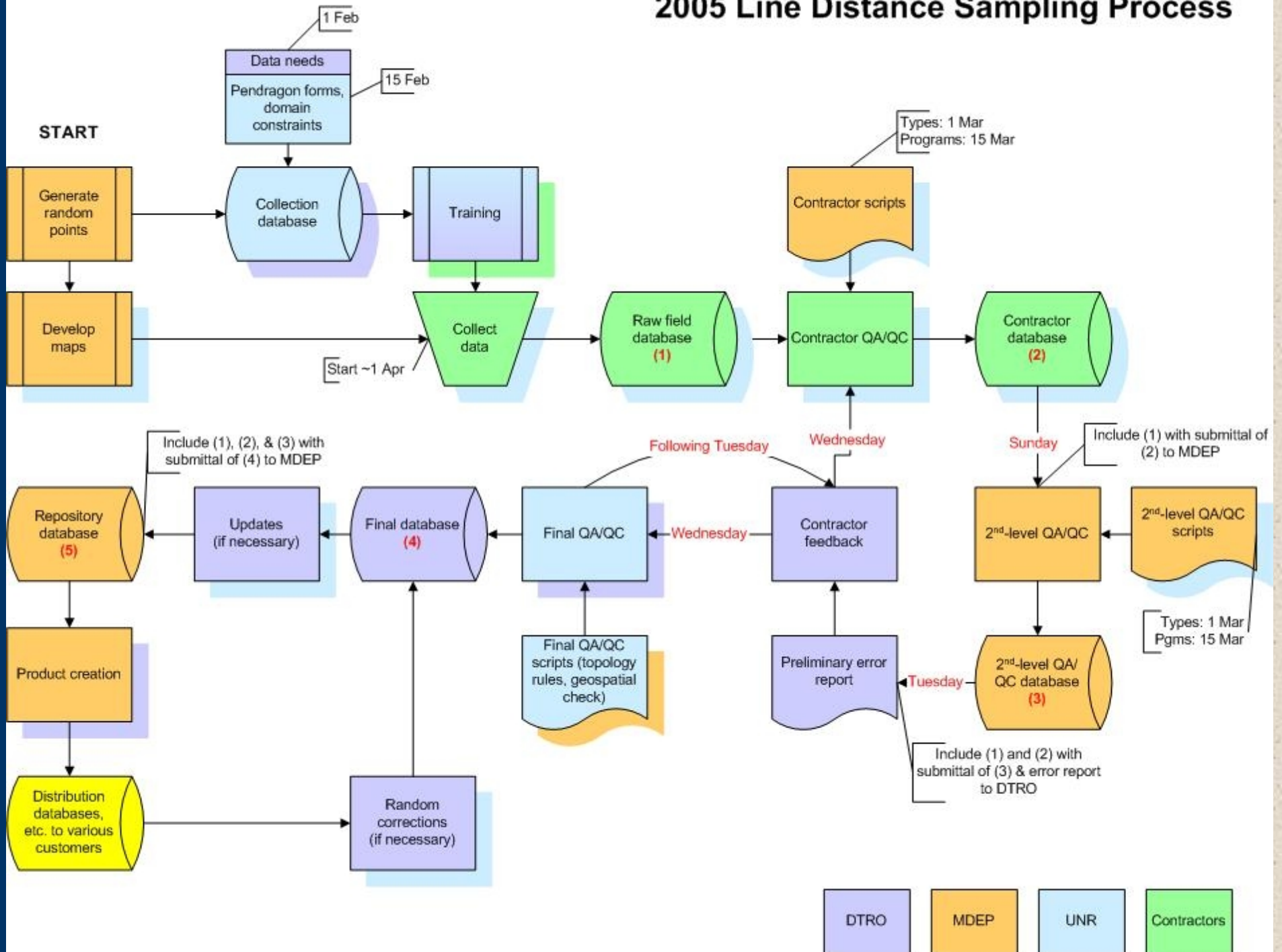


QA/QC 101

- General QA/QC process
  - Establish a set of rules to flag potential errors
  - Identify violations (records that broke the rules)
  - Review and resolve violations (1000's per year)
- Three levels of QA/QC

Contractor QA/QC	Identify and correct common, easily corrected errors
2nd Level QA/QC	Combine contractor databases Verify contractor QA/QC Identify/correct complex errors
Final QA/QC	Verify other levels of QA/QC Identify/correct complex errors Ensure final consistency throughout entire database Create final usable products

2005 Line Distance Sampling Process



QA/QC Products

- GIS files (Geodatabase, Shapefiles, FGDC compliant metadata)
  - transects
  - observations
  - threats
  - health status
  - any supporting data (monitoring strata, random start points, available sample area, etc.)
  - G_0
  - etc.
- Scanned copies of any paper datasheets
- Microsoft Access Database
- Microsoft Excel files

QA/QC Status

- 2001-2004 Beta release
- 2005 Beta scheduled for mid April
- Beta versions do not include
  - data sheets
  - FGDC metadata
  - G_0